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non-exclusion of such totalities, have always infected logic and justified skepticism as to the ultimate soundness of all discourse, however seemingly rigorous. (Such theoretic skepticism may persist anyhow, on other grounds.) Perhaps the most obvious example of an illegitimate totality is the so-called class of all classes. Its illegitimacy may be shown as follows. If A is a class (say that of men) and E is a member of it, we say, E is an A . Now let W be the class of all classes such that no one of them is a member of itself. Then, whatever class x may be, to say that x is a W is equivalent to saying that x is not an x , and hence to say that W is a W is equivalent to saying that W is not a W ! Such illegitimate totalities (and the fallacies they breed) are in general exceedingly sly, insinuating themselves under an endless variety of most specious disguises, and that, not only in the theory of classes but also in connection with every species of logical subject-matter, as propositions, relations and propositional functions. As the propositional function—any expression containing a real (as distinguished from an apparent) variable and yielding either non-sense or else a proposition whenever the variable is replaced by a constant term—is the basis of our authors' work, their theory of logical types is fundamentally a theory of types of propositional functions. It can not be set forth here nor in fewer pages than the authors have devoted to it. Suffice it to say that the theory presents propositional functions as constituting a summitless hierarchy of types such that the functions of a given type make up a legitimate totality; and that, in the light of the theory, truth and falsehood present themselves each in the form of a systematic ambiguity, the quality of being true (or false) admitting of distinctions in respect of order, level above level, without a summit. When Epimenides, the Cretan, says that all statements of Cretans are false, and you reply that then his statement is false, the significance of "false" here presents two orders or levels; and logic must by its machinery automatically prevent the possibility of confusing them.

Next follows a chapter of 20 pages, which all philosophers, logicians and grammarians ought to study, a chapter treating of Incomplete Symbols wherein by ingenious analysis it is shown that the ubiquitous expressions of the form "the so and so" (the "the" being singular, as "the author of Waverley," "the sine of a ," "the Athenian who drank hemlock," etc.) do not of themselves denote anything, though they have contextual significance essential to discourse, essential in particular to the significance of identity, which, in the world of discourse, takes the form of " a is the so and so" and not the form of the triviality, a is a .

After the introduction of 88 pages, we reach the work proper (so far as it is contained in the present volume), namely, Part I.: Mathematical Logic. Here enunciation of primitives is followed by series after series of theorems and demonstrations, marching through 578 pages, all matter being clad in symbolic garb, except that the continuity is interrupted here and there by summaries and explanations in ordinary language. Logic it is called and logic it is, the logic of propositions and functions and classes and relations, by far the greatest (not merely the biggest) logic that our planet has produced, so much that is new in matter and in manner; but it is also mathematics, a prolegomena to the science, yet itself mathematics in the most genuine sense, differing from other parts of the science only in the respects that it surpasses these in fundamentality, generality and precision, and lacks traditionality. Few will read it, but all will feel its effect, for behind it is the urgency and push of a magnificent past: two thousand five hundred years of record and yet longer tradition of human endeavor to think aright.

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A LETTER OF LAMARCK

LETTERS of Lamarck are not often found. M. Landrieux, who has recently published a life of Lamarck, states that "one can count the number of his letters which have come

down to us,"¹ and that "even his autographs are exceedingly rare."

It is of interest, therefore, that another letter in the hand of Lamarck has been discovered in Paris (it is now in my possession), and as it contains several data regarding his life, it may be worthy of publication. It reads as follows:

PARIS ce 16 floréal au 5 de la Rep.
Lamarck professeur au Museum d'hist. naturelle
Au Citoyen Cyalis Lavaux Directeur de la
1^{re} division des domaines

Citoyen

ayant reçu de Songeons, département de l'oise, l'avis que la vente des biens que j'ai Soumissionnés étoit Suspendue et qu'on avoit méconnue l'autorité du Ministre des finances, j'ai eu l'honneur de vous faire passer une lettre par laquelle je me Suis plaint de la Conduite du département à cet égard. j'apprends en ce moment que la personne qui m'a fait passer cet avis m'a trompé, et que le département de l'oise n'a encore pris aucun arrêté qui me fut préjudiciable. je me hâte de vous en instruire pour vous prier de ne donner aucune Suite à la lettre que j'ai eu l'honneur de vous faire passer.

quand le Ministre de l'intérieur aura fait passer à Son Colleague le Ministre des finances les Conditions de la vente de ma Collection, je me recommande à votre bienveillance que vous avez déjà bien voulu me promettre, et pour laquelle je vous prie d'agréer ma vive reconnaissance et mes Salutations fraternelles.

LAMARCK

It will be seen from the above details that Lamarck, like many members of his class, was troubled in matters of property during the upheaval of the revolution. He had maintained his post, poor as it was, in the Jardin des Plantes in 1790, and had made a strong plea for a reorganization of this institution under the republican régime: he had even (1793) gained the day and during the most democratic epoch, he was distinguished as one of the first professors placed in charge of the collections of the Jardin des Plantes. The present letter shows, none the less, that in 1794 Lamarck was concerned about his property at Songeons.

¹"Lamarck le Fondateur du Transformism," 1909, p. 105.

The authorities had not, however, as he later ascertained, confiscated it, and ordered its sale. Still, times were bad and he was probably in financial straits, since he took the opportunity in the same letter to refer to the matter of the sale of his (private) collection, and to "pull a wire" more or less insistently.

BASHFORD DEAN

SPECIAL ARTICLES

THE APPARENT ANTAGONISM BETWEEN ELECTROLYTES AND NONCONDUCTORS

1. In a publication contained in *SCIENCE*, Vol. XXXIV., No. 887, pp. 928, Sumner makes the following statement: "Loeb's assertion that 'salts alone have such antagonistic effects' certainly does not apply to adult fishes. I need only call attention to the fact that cane-sugar solutions of certain strengths were found by me to very clearly defer the fatal action of the copper salts, both upon *Fundulus heteroclitus* and upon certain fresh-water species."

Thirteen years ago I pointed out the fundamental difference between the influence of electrolytes and nonelectrolytes upon life phenomena and in later publications called attention to the fact that this difference indicated an interaction between the electrolytes and colloids, especially the proteins, of the cells, which did not exist between nonelectrolytes and the same colloids of the cells. The further development of colloid chemistry and biology has shown that this conclusion was correct and fruitful. The fact that the toxic action of electrolytes upon the cells can be antagonized by electrolytes only is a special case of this more general rule. In 1902 Gies and I published an apparent exception to this rule, namely, that the toxic action of ZnSO_4 upon *Fundulus* eggs could be inhibited through the addition of cane-sugar; but we pointed out that in this case there is no antagonistic action between ZnSO_4 and cane-sugar in regard to the colloids of the egg (or membrane) but a chemical reaction between ZnSO_4 and cane-sugar which leads to the formation of zinc saccharate, and consequently to a diminution of the Zn ions in solu-